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REMARKS**Status of Claims**

Claims 1-25 are pending in the instant application. Claims 1-25 stand finally rejected. Favorable reconsideration is respectfully requested in light of the following amendments, declaration and remarks.

Non-Compliant Amendment

The Examiner indicated that Applicant's previous amendment is non-compliant for stating claims 1, 12, and 18 were "previously amended", instead of "previously presented". Applicant submits herewith a new version of the marked-up claims to correct this clerical error. Note also, that the status of claim 13 has been also noted herein as "previously presented", since the Examiner indicated in the Office Action that the amendment to claim 13 was acknowledged. No new matter is presented with this revision and Applicant respectfully requests entry of these amendments as now being compliant.

Rejection under 35 USC 112

Claims 13-17 stand rejected under 35 USC 112, second paragraph for the use of the recitation "capable of" in claim 13.

Applicant respectfully traverses this rejection, as it is common practice to use this term, and it does not render the presented claims indefinite to one skilled in the art. In fact a recent search of claims in patents issued since 1976 resulted in 191,663 patents using this term, as shown in the attached printout from the USPTO database dated 5/19/2004. Of those 191,000 patents, five were issued by Examiner El-Arini, including recently-issued USP 6,604,535 (issued Aug. 12, 2003); which includes this term in each of the independent claims; and the '535 patent has four instances of this term in the first claim

alone. A finding that this term *per se* is indefinite would appear to render each of the claims in those nearly 200,000 patents invalid.

Accordingly, Applicants believe that the rejected claims are not indefinite and this rejection is therefore improper and should be withdrawn.

Rejection under 35 USC 103

Claims 1-25 remain rejected under 35 USC 103(a) as being unpatentable over Mulligan et al (6,454,873) in combination with Yount (4,300,955) and Dong (6,251,224).

The Examiner indicated that Applicant's first declaration, which was presented to swear behind Mulligan, was ineffective for failing to include evidence to establish conception.

To preclude reliance by the Examiner upon the Mulligan et al. patent, Applicant submits herewith a new Declaration under 37 C.F.R. § 1.131 of John W. Yount, inventor, and includes evidence to support this assertion, as requested by the Examiner. In accordance with recognized practice, the inventor demonstrates invention prior to the filing date of the Mulligan et al application.

The effective U.S. filing date of the Mulligan et al. patent is May 11, 1999. Mr. Yount's Declaration is effective to show completion of the claimed invention before May 11, 1999 (the date on top of the fax is shown as Apr. 99) and diligence through reduction to practice. Thus, any further use of the Mulligan et al. patent in a rejection should be avoided.

Applicants respectfully submit that the above Declaration under 37 C.F.R. § 1.131 removes Mulligan et al as a reference. None of the other references cited teach or suggest the subject matter of the Mulligan et al patent relied upon for the basis of the rejection, and therefore Applicant believes the Declaration therefore obviates the rejections under 35 USC §103. Accordingly,

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Applicants respectfully request that the 35 USC §103 rejection of claims 1-25 be withdrawn.

CONCLUSION

Applicants submit that claims 1-25 are allowable. The Examiner is invited to telephone the Applicants' undersigned agent at (740) 321-7167 if any unresolved matters remain.

If any questions should arise with respect to the above Remarks, or if the Examiner has any comments or suggestions to place the claims in better condition for allowance, it is requested that the Examiner contact Applicants' attorney at the number listed below.

Applicant authorizes any fees required pertaining to this response, including any extensions of time, be charged to Deposit Account No. 50-0568.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADEIN THE CLAIMS:

1. (Previously Presented) A process for reclaiming fibers from a resinous fibrous product comprising the steps of:
 - (a) selecting an acid for use in an acid bath solution as a function of a type of a resinous residue found on the resinous fibrous product;
 - (b) inserting the resinous fibrous product into a washer/extractor machine, wherein said resinous fibrous product comprises a form including a strand form and a mat form;
 - (c) while said resinous fibrous product is in said machine, performing the steps of:
 - (i) introducing said resinous fibrous product to said acid bath solution heated to approximately 200 degrees Fahrenheit for a period of time sufficient to substantially remove said resinous residue from a fiber portion of the resinous fibrous product;
 - (ii) removing said acid bath solution and said resinous residue from said washer/extractor machine;
 - (iii) rinsing said fiber portion to remove any residual acid bath solution and resinous residue;
 - (d) removing said fiber portion from said washer/extractor machine; and
 - (e) dewatering said fiber portion.
2. (Original) The process of claim 1 further comprising the step of:
 - (iv) applying a sizing composition to said fiber portion prior to the step of (d) removing said fiber portion from said washer/extractor machine.

3. (Original) The process of claim 1 further comprising the step of forming a fiberglass mat from said fiber portion after the step of dewatering said fiber portion.

4. (Original) The process of claim 1, wherein the step of (b) inserting the resinous fibrous product within a washer/extractor machine comprises the step of (b) inserting the resinous fibrous product within a single chamber washer/extractor machine.

5. (Original) The process of claim 1, wherein the step of (b) inserting the resinous fibrous product within a washer/extractor machine comprises the step of (b) inserting the resinous fibrous product within an electronically controlled single chamber washer/extractor machine

6. (Original) The process of claim 1, wherein the step of (b) inserting the resinous fibrous product within a washer/extractor machine comprises the step of (b) inserting the resinous fibrous product within a multi-chamber washer/extractor machine.

7. (Original) The process of claim 1, wherein the step of (b) inserting the resinous fibrous product within a washer/extractor machine comprises the step of (b) inserting the resinous fibrous product within an electronically controlled multi-chamber washer/extractor machine.

8. (Original) The method of claim 1, further comprising the step of (f) drying said fiber portion in an oven.

9. (Original) The method of claim 1, wherein the acid bath solution comprises said acid and a quantity of water in a ratio of between ten and fifty percent acid to water by volume.

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10. (Original) The method of claim 1, wherein said resinous fibrous product comprises glass fibers.

11. (Original) The method of claim 1, further comprising the steps of:
forming a slurry comprising said fibers and a binder; and
forming a wet-process mat from said slurry.

12. (Previously Presented) The method of claim 11,
wherein the step of forming said slurry comprises the step of forming a slurry within said washer/extractor machine, said slurry comprising said fibers and a binder.

13. (Previously Presented) A method for recovering a resinous residue from a resinous fibrous product capable of being further processed into a usable nitrogen product comprising the steps of:

selecting an acid for use in an acid bath solution as a function of a type of the resinous residue found on the resinous fibrous product;

inserting the resinous fibrous product within a washer/extractor machine, wherein the resinous fibrous product is in the form of a plurality of strands or in the form of a mat;

introducing said resinous fibrous product to said acid bath solution heated to approximately 200 degrees Fahrenheit for a period of time sufficient to substantially remove the resinous residue from a fibrous portion of the resinous fibrous product;

removing said acid bath solution and the resinous residue from said washer/extractor machine;

introducing said acid bath solution and the resinous residue into a cooling line to precipitate the resinous residue; and

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removing the precipitated resinous residue from said acid bath solution using a clarifier.

14. (Original) The process of claim 13, wherein the step of inserting the resinous fibrous product within a washer/extractor machine comprises the step of inserting the resinous fibrous product within a single chamber washer/extractor machine.

15. (Original) The process of claim 13, wherein the step of inserting the resinous fibrous product within a washer/extractor machine comprises the step of inserting the resinous fibrous product within an electronically controlled single chamber washer/extractor machine.

16. (Original) The process of claim 13, wherein the step of inserting the resinous fibrous product within a washer/extractor machine comprises the step of inserting the resinous fibrous product within a multi-chamber washer/extractor machine.

17. (Original) The process of claim 13, wherein the step of inserting the resinous fibrous product within a washer/extractor machine comprises the step of inserting the resinous fibrous product within an electronically-controlled multi-chamber washer/extractor machine.

18. (Previously Presented) A method for reclaiming fibrous and a resinous residue from a resinous fibrous product in the form of a strand or a mat comprising the steps of:

selecting an acid for use in an acid bath solution as a function of a type of the resinous residue found on the resinous fibrous product;

inserting the resinous fibrous product within a washer/extractor machine;

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introducing said resinous fibrous product to said acid bath solution heated to approximately 200 degrees Fahrenheit for a period of time sufficient to substantially remove the resinous residue from a fibrous portion of the resinous fibrous product;

removing said acid bath solution and said resinous residue from said washer/extractor machine;

rinsing said fibrous portion to remove any residual acid bath solution and resinous residue;

removing said fibrous portion from said washer/extractor machine;

dewatering said fibrous portion;

introducing said acid bath solution and said resinous residue into a cooling line to precipitate said resinous residue; and

removing said precipitated resinous residue from said acid bath solution using a clarifier.

19. (Original) The process of claim 18, wherein the step of inserting the resinous fibrous product within a washer/extractor machine comprises the step of inserting the resinous fibrous product within an electronically-controlled single-chamber washer/extractor machine

20. (Original) The process of claim 18, wherein the step of inserting the resinous fibrous product within a washer/extractor machine comprises the step of inserting the resinous fibrous product within a multi-chamber washer/extractor machine.

21. (Original) The process of claim 18, further comprising the step of drying said fibrous portion in an oven.

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22. (Original) The process of claim 18, further comprising the step of applying a sizing composition to said fibrous portion prior to the step of removing said fibrous portion from said washer/extractor machine.

23. (Original) The process of claim 18, wherein said acid bath solution comprises said acid and a quantity of water in a ratio of between ten and fifty percent acid to water by volume.

24. (Original) The process of claim 23, wherein said acid is phosphoric acid.

25. (Original) The process of claim 18 further comprising the step of forming a fibrous mat from said fibrous portion after the step of dewatering said fibrous portion.

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PAT. NO. Title

- 1 6,738,952 ■ Navigational map data object selection and display system
- 2 6,738,937 ■ Method for nondisruptive testing of device and host attachment to storage subsystems
- 3 6,738,931 ■ Reliability assessment method, apparatus and system for quality control
- 4 6,738,930 ■ Method and system for extending the functionality of an environmental monitor for an industrial personal computer
- 5 6,738,907 ■ Maintaining a soft-token private key store in a distributed environment
- 6 6,738,905 ■ Conditional access via secure logging with simplified key management
- 7 6,738,904 ■ Recordable storage medium with protected data area
- 8 6,738,900 ■ Method and apparatus for distributing public key certificates
- 9 6,738,894 ■ Data processor
- 10 6,738,882 ■ Concurrent multi-processor memory testing beyond 32-bit addresses
- 11 6,738,832 ■ Methods and apparatus in a logging system for the adaptive logger replacement in order to receive pre-boot information
- 12 6,738,825 ■ Method and apparatus for automatically provisioning data circuits
- 13 6,738,817 ■ System and method for enabling graphic applications in an interactive programming model
- 14 6,738,806 ■ Method and system of deploying an application between computers
- 15 6,738,798 ■ Automated monitoring of collection of operational data from medical imaging devices
- 16 6,738,785 ■ Search unit, search system and search method
- 17 6,738,773 ■ Method and system for transforming data between disparate capacity database systems
- 18 6,738,772 ■ Access control system having automatic download and distribution of security information
- 19 6,738,765 ■ Relational text index creation and searching
- 20 6,738,760 ■ Method and system for providing electronic discovery on computer databases and archives using artificial intelligence to recover legally relevant data
- 21 6,738,738 ■ Automated transformation from American English to British English

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ACLM/"capable of" AND EXP/El-Arini

PAT. NO. Title

- 1 6,604,535 [Substrate cleaning apparatus and method](#)
- 2 5,913,982 [Water driven bathroom scrub brush system](#)
- 3 5,716,454 [Decontamination of devices and instruments contacted with body tissues](#)
- 4 5,702,537 [Method for removing liquid edge bead](#)
- 5 5,509,968 [Decontamination of orthopaedic implants](#)

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US006604535B2

(12) United States Patent
Shih

(10) Patent No.: US 6,604,535 B2
(45) Date of Patent: Aug. 12, 2003

(54) SUBSTRATE CLEANING APPARATUS AND METHOD

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(73) Assignee: Applied Materials, Inc., Santa Clara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 83 days.

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(30) Foreign Application Priority Data

Sep. 28, 2000 (TW) 89120138 A

(51) Int. Cl.⁷ B08B 3/00

(52) U.S. Cl. 134/95.3; 134/102.1; 134/153; 134/902

(58) Field of Search 134/153, 102.1, 134/902, 95.3

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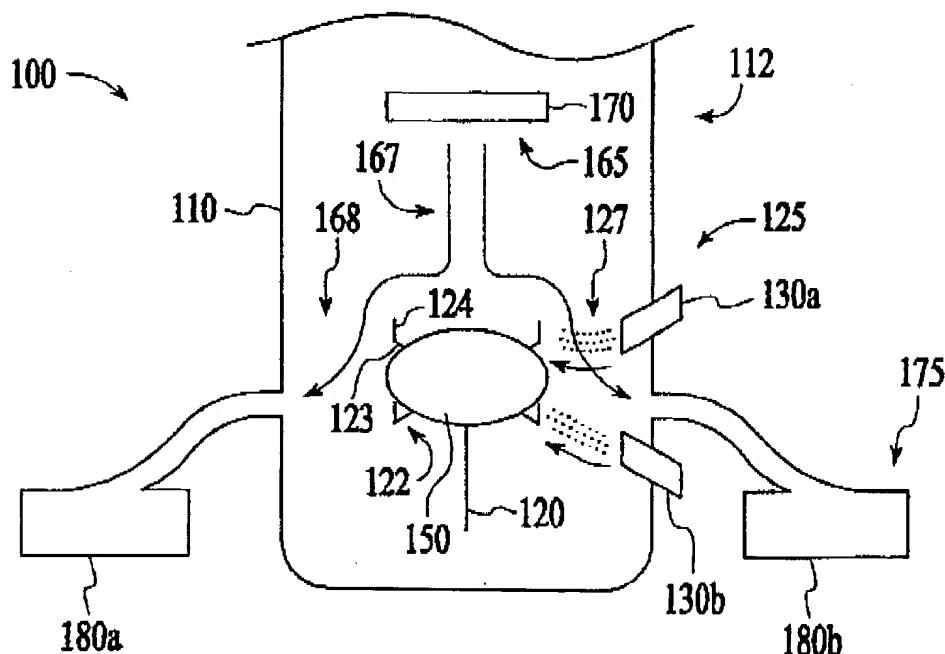
Primary Examiner—Zeinab El-Ajini

(74) Attorney, Agent, or Firm—Janab & Associates

(57) ABSTRACT

A substrate cleaning apparatus includes a chamber having a substrate support capable of supporting and rotating a substrate in the chamber. A cleaning solution injector is provided to inject a cleaning solution onto the substrate in the chamber. A portion of the cleaning solution is thrown off the rotating substrate to form a cleaning solution mist in the chamber. A cleaning gas inlet introduces a cleaning gas into the chamber and an outlet exhausts the cleaning solution mist and cleaning gas from the chamber. This reduces the formation of residues from the cleaning solution mist on the substrate.

15 Claims, 2 Drawing Sheets



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The substrate cleaning apparatus 100 further comprises a cleaning gas supply 165 comprising one or more cleaning gas inlets 170 capable of introducing a cleaning gas 167, such as nitrogen, into the chamber 110. The number and arrangement of cleaning gas inlets 170 may depend upon the size of the chamber 110. In an exemplary version, the cleaning gas supply 165 comprises a cleaning gas inlet 170, that is located centrally above the substrate support 120, such as at the top of the chamber 110.

The cleaning gas supply 165 also comprises an exhaust 175 comprising one or more outlets 180a, 180b capable of exhausting cleaning gas 167 and cleaning solution mist 168 that is formed during the cleaning process. In an exemplary version, the exhaust 175 comprises two outlets 180a, 180b located about the sidewall 112 of the chamber 110. The outlets 180a, 180b may be located at the level of, or below, the height of the substrate 150 in the chamber 110.

In operation, after the substrate 150 is placed on the substrate holder 120, the substrate holder 120 moves to the proper position. Then, the substrate holder 120 is rapidly rotated causing synchronous rotation of the substrate 150. The cleaning gas supply 165 introduces cleaning gas 167 into the chamber 110 via the cleaning gas inlet 170. The cleaning solution injector 125 injects the cleaning solution 127 into the chamber 110 and onto the substrate 150. The cleaning solution may be a liquid cleaning solution. The cleaning solution 127 impacts the substrate 150 and at least partially mists to form a cleaning solution mist 168. The cleaning gas outlets 180a, 180b exhaust the cleaning solution mist 168 and cleaning gas 167 from the chamber 110.

The cleaning gas 167 flows from the cleaning inlet 170 to the cleaning gas outlets 180a, 180b. The cleaning solution mist 168 also approximately follows the path of the cleaning gas 167 to the cleaning gas outlet 180a, 180b, as shown in FIG. 4. Therefore, the cleaning solution mist 168 does not remain in the chamber 110, and does not form a liquid residue 55 on the substrate surface after the cleaning process. Thus, the disadvantages associated with forming the liquid residues 55 on the substrate surface in the prior art are reduced.

According to the present invention, a substrate 150 may be optimally cleaned when the total volume of the cleaning gas 167 introduced to the chamber 110 via the cleaning gas inlet 170 is greater than or equal to the total volume of the cleaning solution mist 168 and cleaning gas 167 that is exhausted by the outlets 180a, 180b. If the total volume of the cleaning gas 167 introduced into the chamber 110 by the cleaning gas inlet 170 is less than the total volume of the cleaning solution mist 168 and cleaning gas 167 exhausted by the outlets 180a, 180b, air may enter the chamber 110 and contaminate the substrate 150.

Thus, the present substrate cleaning apparatus 100 and method is advantageous because it allows for better substrate cleaning and reduces the formation of liquid residues on the substrate 150.

Although the present invention has been described in considerable detail with regard to certain preferred versions thereof, other versions are possible. For example, the present invention may be used to clean other substrates, such as electronic circuits. The substrate cleaning apparatus may also comprise other equivalent configurations as would be apparent to one of ordinary skill in the art. Thus, the appended claims should not be limited to the description of the preferred versions contained herein.

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What is claimed is:

1. A substrate cleaning apparatus comprising:
a chamber;
a substrate support capable of supporting and rotating a substrate in the chamber;
a cleaning solution injector capable of injecting a cleaning solution onto the substrate in the chamber, thereby forming a cleaning solution mist in the chamber, the cleaning solution injector being located at a sidewall of the chamber;
a cleaning gas inlet capable of introducing a cleaning gas into the chamber, the cleaning gas inlet being located at a top of the chamber; and
an outlet capable of exhausting the cleaning gas and the cleaning solution mist.
2. The apparatus of claim 1 wherein the cleaning gas inlet is above the substrate.
3. The apparatus of claim 1 wherein the outlet is at the level of or below the substrate.
4. The apparatus of claim 1 wherein the cleaning gas inlet introduces a total volume of the cleaning gas into the chamber that is greater than the total volume of the cleaning solution mist and cleaning gas exhausted by the outlet.
5. The apparatus of claim 1 wherein the cleaning gas inlet introduces a total volume of the cleaning gas into the chamber that is substantially equal to the total volume of the cleaning solution mist and cleaning gas exhausted by the outlet.
6. The apparatus of claim 1 wherein the cleaning gas comprises nitrogen.
7. A substrate cleaning apparatus comprising:
a chamber;
a substrate support in the chamber, the substrate support capable of supporting a substrate and rotating the substrate in the chamber;
an upper cleaning solution injector nozzle, located at a sidewall of the chamber and higher than the substrate, the injector nozzle capable of injecting a cleaning solution into the chamber;
a lower cleaning solution injector nozzle, located at the sidewall of the chamber and lower than the substrate, the injector nozzle capable of injecting the cleaning solution into the chamber;
a cleaning gas inlet located at a top of the chamber, the cleaning gas inlet capable of introducing a cleaning gas into the chamber; and
a plurality of outlets located at the sidewall of the chamber, the outlets capable of exhausting from the chamber, a cleaning solution mist formed from the cleaning solution and the cleaning gas.
8. The apparatus of claim 7 wherein the cleaning gas inlet introduces a total volume of cleaning gas into the chamber that is greater than the total volume of the cleaning solution mist and cleaning gas exhausted by the outlets.
9. The apparatus of claim 7 wherein the cleaning gas inlet introduces a total volume of the cleaning gas into the chamber that is substantially equal to the total volume of the cleaning solution mist and cleaning gas exhausted by the outlets.
10. The apparatus of claim 7 wherein the cleaning gas comprises nitrogen.
11. A substrate cleaning apparatus comprising:
a chamber;
a substrate support capable of supporting and rotating a substrate in the chamber;

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a cleaning solution injector capable of injecting a cleaning solution onto the substrate in the chamber, thereby forming a cleaning solution mist in the chamber, the cleaning solution injector being located at a sidewall of the chamber;

means for introducing a cleaning gas into the chamber from top of the chamber; and
means for exhausting the cleaning solution mist and cleaning gas from the chamber.

12. The apparatus of claim 11 wherein the means for introducing a cleaning gas into the chamber comprises a cleaning gas inlet above the substrate.

13. The apparatus of claim 12 wherein the cleaning gas at introduces a total volume of the cleaning gas into the

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chamber that is greater than the total volume of the cleaning solution mist and cleaning gas exhausted by the exhausting means.

14. The apparatus of claim 12 wherein the cleaning gas inlet introduces a total volume of the cleaning gas into the chamber that is greater than the total volume of the cleaning solution mist and cleaning gas exhausted by the exhausting means.

15. The apparatus of claim 11 wherein the means for exhausting the cleaning solution mist and cleaning gas from the chamber comprises an outlet at a level that is substantially equal to, or below, the substrate.

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